Lecture and Presentation Topics (tentative)
CS 7301: Recent Advances in Cloud Computing

- Cloud storage systems
  - The rise of “big data” on cloud computing: Review and open research issues
  - Consistency models
    - Conventional models, current cloud practices
    - Do we need new models?
  - Erasure coding
    - Fundamentals, from RAID to Reed Solomon
    - Practical erasure coding in the cloud
    - Performance of erasure coding schemes
- Access to erasure codes: Yongtao Huang (2/6)
- SaaS technologies and SaaS security
  - SaaS technologies: A short overview
  - Access control models for SaaS
    - Existing access control models
    - What is the difference in SaaS and what are the access control models that are suitable for SaaS
  - Information flow control and data provenance for SaaS
    - Fundamental concepts in information flow control and why they are not sufficient for SaaS
    - New models and research
  - Taint analysis: Timothy Hoffman (2/27)
  - Semantic based service composition in the SaaS cloud: Wei Zhu
  - SaaS development technologies (with MDA): Nidhi Solanki and Uzma Azim
    - Last three topics will be presented during 3/5-12
- Virtualization, resource management, and security in the cloud
  - Summary of virtualization basics
    - CPU virtualization: Technologies evolution
    - Memory virtualization: Shadow page and ballooning
  - IaaS cloud resource management
    - VM workload prediction
    - VM placement
  - Trusted processors and its role in cloud computing
    - Most research on cloud security focuses on intrusion detection (IDS)
    - What if intruder successfully compromises the system
    - Data protection even if the system is hacked
  - Secret sharing and homomorphic encryption for cloud data protection
    - Cloud provider is malicious, or having insider attacks
    - Ultimate protection to customer data
    - Allow computation being performed on encrypted data
- VM security: Shuai Zhang (roughly 3/26 or 4/2)
- IoT Cloud and big data
  - Cloud computing for Internet of Things & sensing based applications
  - The Internet of things: A survey from the data-centric perspective
- An IoT-oriented data storage framework in cloud computing platform
- An efficient index for massive IOT data in cloud environment

- IoT cloud and security: Hessam Moeini (roughly 4/2 or 4/9)
- Data provenance in IoT and cloud: Anthony Opara
- Building an ad hoc communication infrastructure for IoT cloud: Guang Zhou (roughly 4/2 or 4/9)

- Back to Cloud storage systems
  - Better erasure codes: Yongtao Huang (roughly 4/9 or 4/16)

- More efficient computation in the cloud
  - MapReduce and other data parallel computation models
  - Computer vision basics and using cloud for computer vision: Jinwei Yuan (roughly in the 4/16 or 4/23)

- Project demo and presentation in the last two weeks
Papers for the presentation topics (incomplete)

Cloud Storage
- Access to erasure codes: Yongtao Huang
  - Secure, dependable, and high performance cloud storage
- Better erasure codes: Yongtao Huang
  ♦ Rethinking erasure codes for cloud file systems: Minimizing I/O for recovery and degraded reads
  ♦ Simple regenerating codes: Network coding for cloud storage
  ♦ Tree-structured data regeneration with network coding in distributed storage systems
- Cloud load balancing: N/A
  ♦ A comparative study into distributed load balancing algorithms for cloud computing
  ♦ Ananta: Cloud scale load balancing
  ♦ Stochastic Models of load balancing and scheduling in cloud computing clusters
  ♦ Efficient, proximity-aware load balancing for DHT-based P2P systems
  ♦ Locality-aware and churn-resilient load-balancing algorithms in structured peer-to-peer networks
  ♦ The server reassignment problem for load balancing in structured P2P systems

SaaS
- Information Flow Control and Taint analysis: Timothy Hoffman
  ♦ A sound type system for secure flow analysis
  ♦ Dynamic vs. Static flow-sensitive security analysis
  ♦ TaintDroid: An information-flow tracking system for realtime privacy monitoring on smart phones
  ♦ Towards fully automatic placement of security sanitizers and declassifiers
- SaaS development technologies: Nidhi Solanki and Uzma Azim
  ♦ Model driven architecture: Principles and practice
  ♦ Model driven engineering: Automated code generation and beyond
    http://resources.sei.cmu.edu/asset_files/technicalnote/2015_004_001_435420.pdf
  ♦ Domain-specific modeling for full code generation
Automatic code generation by model transformation from sequence diagram of system’s internal behavior

A survey of model driven engineering tools for user interface design

From UML diagrams to behavioral source code


A MDA-based environment for web applications development: From conceptual models to code

EasySaaS: A SaaS development framework

Comparing PaaS offerings in light of SaaS development

Cloud SaaS and model driven architecture

Software customization based on model-driven architecture over SaaS platforms

A template-based model transformation approach for deriving multi-tenant SaaS applications

Enhancing cloud SaaS development with model driven architecture

Semantic based service composition in the SaaS cloud: Wei Zhu

Software development by crowdsourcing: N/A

Two's company, three's a crowd: a case study of crowdsourcing software development

Creative software crowdsourcing: from components and algorithm development to project concept formations

Collaborative software development platforms for crowdsourcing

Virtualization

Security issues in virtualization technologies: Shuai Zhang


Security for IoT cloud: Hessam Moeini

Enforcing security mechanisms in the IP-based Internet of things: An algorithmic overview

A capability-based security approach to manage access control in the Internet of Things

Identity establishment and capability based access control (IECAC) scheme for Internet of Things

Securing the IP-based Internet of Things with HIP and DTLS

Key management systems for sensor networks in the context of the Internet of Things

Sensor network security: A survey
♦ Wireless sensor network security: A survey

➢ IoT data management
  ♦ The Internet of Things: A survey from the data-centric perspective
  ♦ Supporting streaming updates in an active data warehouse
  ♦ Semantics for the Internet of Things: Early progress and back to the future
  ♦ An extensible and active semantic model of information organizing for the Internet of Things
  ♦ Massive heterogeneous sensor data management in the Internet of Things
  ♦ Sensor search techniques for sensing as a service architecture for the Internet of Things
  ♦ Towards a quality-centric big data architecture for federated sensor services
  ♦ Ubiquitous data accessing method in IoT-based information system for emergency medical services
  ♦ An information framework for creating a smart city through Internet of Things

➢ Data Provenance and Information Flow Control in IoT and Cloud
  ♦ A survey of data provenance techniques
  ♦ Provenance for the Cloud
  ♦ Data Provenance in the Internet of Things
  ♦ Securing tags to control information flows within the Internet of Things
  ♦ Information flow control for collaborative distributed data fusion and multisensor multitarget tracking

➢ Building ad hoc communication infrastructure in IoT cloud: Guang Zhou

➢ Container technologies and security: N/A
  ♦ Container-based operating system virtualization: a scalable, high-performance alternative to hypervisors
  ♦ Containers and cloud: From lxc to Docker to Kubernetes
  ♦ Performance evaluation of container-based virtualization for high performance computing environments
  ♦ Virtualization: A survey on concepts, taxonomy and associated security issues
  ♦ Analysis of Docker security
  ♦ Provisioning software-defined IoT cloud systems

Computation in the Cloud

➢ Computer vision basics and using cloud for computer vision: Jinwei Yuan

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